



LEARNING OUTCOMES

After completing this chapter, you should be able to:

- Define X PRIZE.
- Describe the mission of X PRIZE.
- State some reasons for why X PRIZE was created.
- Identify some of the teams that are competing.
- Explain how the prize can be won.
- Describe some of the benefits to be derived from X PRIZE.

X PRIZE

The excitement is building! The X PRIZE could be won in a few months! This chapter will discuss what the X PRIZE is all about and describe a few of the leading candidates to capture the prize. Much of this information comes from the X PRIZE website.

MISSION AND PURPOSE

In 1995, Dr. Peter Diamandis established the X PRIZE Foundation with the assistance of Byron Lichtenberg, Colette Bevis, and Gregg Maryniak. The Foundation was initially headquartered in



The X PRIZE Board of Trustees

Rockville, Maryland but moved to St. Louis, Missouri in 1996.

The X PRIZE is a \$10 million prize to jumpstart the space tourism industry through competition between the most talented entrepreneurs and rocket experts in the world. The \$10 million cash prize will be awarded to the first team that: a) privately finances, builds and launches a spaceship, able to carry three people to 62.5 miles (100 kilometers)(the edge of space); b) returns safely to Earth; c) repeats the launch with the same ship within 2 weeks.

The X PRIZE competition follows in the footsteps of more than 100 aviation incentive prizes offered between 1905 and 1935, which created today's multibillion-dollar air transport industry. The X PRIZE was inspired by the early aviation prizes of the 20th Century, primarily the spectacular trans-Atlantic flight of Charles Lindbergh in The Spirit of St. Louis, which captured the \$25,000 Orteig prize in 1927. Through a smaller, faster, better approach to aviation, Lindbergh and his

financial supporters, demonstrated that a small professional team could outperform a large, government-style effort.

Vice President and one of the trustees of the X PRIZE Foundation is Erik Lindbergh, a grandson of Charles Lindbergh. To help support X PRIZE and to commemorate the 75th anniversary of his grandfather's flight, Erik recreated that famous flight over the Atlantic Ocean in May 2002. Erik successfully flew nonstop from New York to Paris in 17 hours, 7 minutes in a Lancair Columbia 300. Upon his arrival in Paris, the press asked him what he would do next, and Erik replied that he looked forward to flying into space with X PRIZE.

Ever since man landed on the moon, the general public has waited for an opportunity to enjoy the space frontier on a first-hand basis. The X PRIZE Foundation is working to make space travel possible for all. The spaceships that compete for the X PRIZE are designed to carry passengers. Some of the benefits from X PRIZE include:

- creation of a new generation of heroes;
- inspiring and education students;
- focusing public attention and investment capital on this new business frontier;
- challenging explorers and rocket scientists around the world; and
- vehicles built for the X PRIZE will eventually serve four different industries; space tourism, low-cost satellite launching, same-day package delivery, and rapid point-to-point passenger travel.

The mission of the X PRIZE Foundation is to create a future in which the general public will personally participate in space travel and its benefits. The foundation seeks to do this by: organizing and implementing competitions to accelerate the development of low-cost spaceships for travel, tourism and commerce; creating programs which allow the public to understand the benefits of low-cost space travel; and providing the public with the opportunity to directly experience the adventure of space travel.

X PRIZE believes that space flights should be

open to everyone, not just the ultra-rich. They believe that commercial forces will bring space flights into a publicly affordable range. The Foundation believes that the resources of space are the key to enhancing the wealth of all nations while preserving the environment of Earth.

They also believe that the risks involved in human space flight are far outweighed by the benefits to the participant and to humanity. X PRIZE will use the utmost efforts to foster safety for participants, observers and the public in all X PRIZE activities.

In October 2002, a report published by the U.S. Department of Commerce's Office of Space Commercialization stated that X PRIZE was a potent catalyst for the sub-orbital commercial space transportation industry. The report goes on to say that commercial space transportation entrepreneurs were shifting their focus to

the sub-orbital market, which is the exact market X PRIZE is working to develop.

As of March 2004, 27 teams, from seven different countries, have entered the competition for the X PRIZE. Here is a closer look at some of those teams and their innovative ideas for winning the competition.

COMPETITION

Scaled Composites

This team, headed by Burt Rutan, was the first team to register for the X PRIZE. Rutan is known principally for designing and flying the Voyager, the first plane to fly around the world without refueling. Scaled Composites is located in Mojave, California.

Recently Rutan unveiled his future manned spacecraft, a space-faring vehicle called SpaceShipOne and the airborne launcher, the White Knight. This research vehicle was designed to investigate the feasibility of low cost sub-orbital space flight. The team's goal is to demonstrate that non-government manned space flight can be



Dr. Peter Diamandis and Erik Lindbergh

done at very low costs. Safety is of the utmost importance, but low cost is also critical. This team looks forward to a future where ordinary people, for the cost of a luxury cruise, can rocket into the sky above the earth's atmosphere. Rutan believes that the X PRIZE competition has the ability to help make private space flight and space tourism a reality.

Rutan's plan involves flight in a spaceship, initially attached to a turbojet launch aircraft while climbing for an hour to 50,000 feet, above 85% of the atmosphere. The spaceship then drops into gliding flight and fires its rocket motor while climbing steeply for more than a minute, reaching a speed of 2,500 mph. The ship coasts up to 62 miles altitude then falls back into the atmosphere. The coast and fall are under weightless conditions for more than three minutes. During weightless



SpaceShipOne Aboard the White Knight Launcher

flight, the spaceship converts to a high-drag configuration to allow a safe stable atmospheric entry. After the entry deceleration, which takes more than a minute, the ship converts back to a conventional glider, allowing a leisurely 17-minute glide from 80,000 feet altitude down to a runway where the landing is made at light plane speeds.

On December 17, 2003, Scaled Composites took a major step forward in the competition. They flew the first manned supersonic flight by an aircraft developed by a private, non-government effort. SpaceShipOne test pilot Brian Binnie flew to an altitude of 68,000 feet. During the landing, the left landing gear received minor damage, but no one was hurt.

To learn more about Scaled Composites click on www.scaled.com.

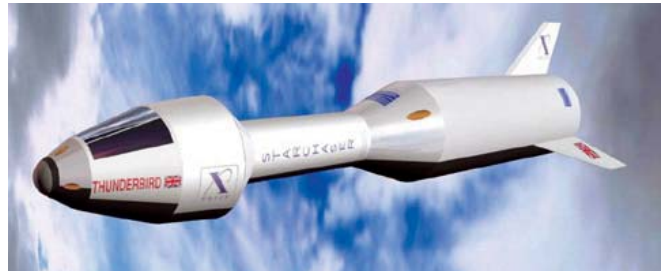
Starchaser Industries

Steve Bennett, Director of the Space Technology Laboratory, Salford University, England, began Starchaser as an experimental rocket test program in 1992. In 1996, the team successfully launched the largest private civilian

rocket (21 ft) ever built and flown in Europe. In 1997, they entered the X PRIZE competition.

In 1999, Bennett unveiled his next generation rocket and X PRIZE entry, Thunderbird. This was a full-scale mockup at the time, but he has since performed many tests. The flight sequence for the Thunderbird begins with an ascent in a vertical orientation using solid boosters and liquid rocket engines. At higher altitudes the main liquid oxygen/kerosene rocket engine will take over, becoming the major propulsive force in the now rarefied atmosphere. Acceleration will be kept below 3G's for the comfort of the passengers. Following main engine cutoff the vehicle will continue to coast on up to an apogee exceeding 62 miles where the occupants will experience several minutes of microgravity.

Starchaser believes the space frontier is about



Thunderbird

to open up. Experts are predicting that a global space tourism industry worth \$10 billion will be the big business of the early 21st century. The operation of low cost launchers for micro satellite applications and the concept of space tourism, in the form of short sub-orbital pleasure flights are certainly possible, and Starchaser thinks quite viable.

On December 12, 2003, Starchaser unveiled its new Thunderstar X PRIZE competition vehicle design.

To learn more about Starchaser Industries click on www.starchaser.co.uk.

The da Vinci Project

The da Vinci Project is located in Toronto, Ontario, Canada and is a team of about 30 volunteers from Canada's aerospace industry, led by Brian Feeney. It is Canada's first entry in the X PRIZE competition.

The da Vinci Project will launch its spacecraft (Wild Fire) from the world's largest helium balloon.

The 3,270 kg rocket will be tethered 720 meters below the balloon and lifted over the course of an hour to an altitude of 80,000 feet. The 10,000 pound thrust, liquid oxygen, and kerosene engines will fire the first stage and the rocket will fly an initial angular trajectory to clear the balloon. The spacecraft then will transition to vertical flight to its apogee of 120 km in space. The rocket's maximum speed on both its ascent and re-entry is Mach 4, or 4,250 kph, or 2650 mph. An innovative ballute will protect and stabilize the rocket on re-entry. A flyable parachute will be deployed at 25,000 feet and the rocket will descend under control, probably guided by GPS, to a predetermined landing zone.



Wild Fire Spacecraft, right, will be launched by the world's largest helium balloon, left.

The Wildfire rocket's structure is a combination of a 6-point truss work integrated to a carbon fiber aeroshell. The spherical crew capsule is pressurized to one atmosphere and oval windows wrap around it for a spectacular view. The pilot's seat is centered with the two remaining seats angled to the side. Flight control is achieved through a programmable FAA approved autopilot from a turbine class of aircraft.

To learn more about The da Vinci Project click on www.davinciproject.com.

Kelly Space & Technology (KST)

KST is an engineering design and technology development company located in San Bernardino, California. KST joined with Vought Aircraft Industries for the purpose of developing a family of low cost, reusable, commercial sub-orbital and

orbital launch vehicles.

KST named their spacecraft Astroliner, and they believe it will provide low-cost, reliable access to space. Astroliner will be tow-launched by a Boeing 747 from a conventional runway to its launch altitude. The Astroliner is reusable. It has a fully reusable first stage, which is the most expensive part of the vehicle.

Then, the Astroliner's second stage is expendable, which eliminates the weight of reentry insulation and recovery systems.

In the last few years, NASA has awarded KST several million dollars. KST was awarded a contract to perform a space transportation architecture study, and the following year was awarded a contract for a follow-up study that focused on



The Astroliner is towed by a Boeing 747.

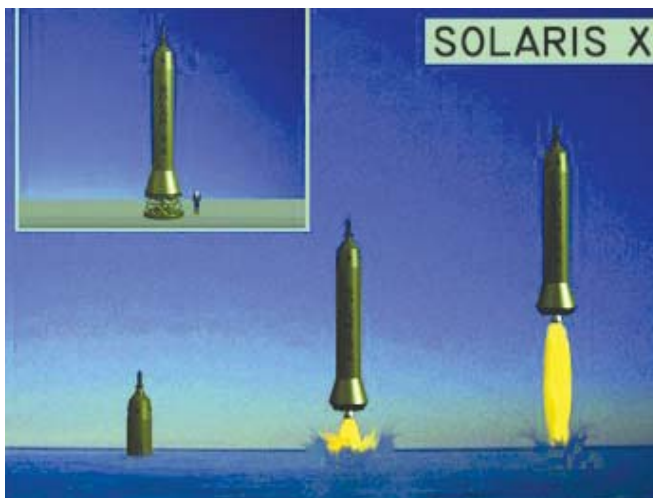
developing space transportation through the year 2030.

To learn more about Kelly Space & Technology click on www.kellyspace.com.

Interorbital Systems (IOS)

Interorbital is a privately funded aerospace corporation based in Mojave, California, that develops, manufactures, and tests liquid rocket engines, space launch vehicles, and spacecraft. IOS brings the first woman-owned team and first woman pilot into the X PRIZE competition. Wally Funk, one of the original "Mercury 13" female astronaut trainees in the early 1960s will pilot the SOLARIS X in the X PRIZE competition.

SOLARIS X is a liquid-propelled, vertical take-off/horizontal landing vehicle that will become the flagship of IOS' future sub-orbital space tourism operations. IOS is presently engaged in the



development of its Neptune-Solaris Orbital Spaceliner, a two-stage manned reusable orbital launcher. The orbiter upper stage in this configuration is the SOLARIS X rocket plane.

Randa Milliron, CEO and co-founder of IOS is confident of the revenue potential of their enterprise and has started to sell advance purchase tickets for the sub-orbital flights on eBay, under the search title of "Ride a Rocket."

To learn more about Interorbital Systems click on www.interorbital.com.

Vanguard Spacecraft

Vanguard is located in Bridgewater, Massachusetts. The ship's name is Eagle. The Vanguard series launch vehicle, the Vanguard Eagle, consists of two booster stages and spacecraft. The booster stages include fuel tank housing and solid fuel booster housings. The Vanguard Eagle follows a traditional vertical take-off and ballistic reentry mission plan. The flight begins with a vertical launch and a crew of four. The first stage will provide a primary lift-off thrust



Vanguard Eagle

for the first 50 kilometers. The second stage will carry the Eagle to an altitude of 75 kilometers where the spacecraft will separate stages and return to Earth via parachute. After the booster fuel is exhausted, the booster stages separate, and the capsule coasts to an altitude of 100 kilometers.

No web site is available at this time.

IL Aerospace Technologies (ILAT)

IL Aerospace is located in Zichron Ya'akov, Israel. Their spacecraft is called the Negev 5, and it is a self-sufficient reusable sub-orbital space



Negev 5

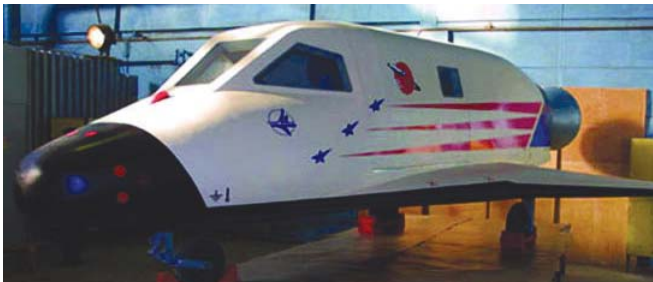
vehicle capable of being launched and recovered anywhere in the world from land or sea without the need of runways, assist aircraft, costly installations or complicated procedures. The vehicle will be a pressurized 3-person habitat equipped with all the essential instrumentation for flight, navigation, communications and life-support. The vehicle will be constructed employing lightweight aircraft-grade alloys and composite materials, while the propulsion system will utilize the latest hybrid rocket technology. The Negev 5 will be launched from ground level using ILAT's own fully reusable

High Altitude Launch Platform. The concept allows the vehicle a free ride on a large stratospheric balloon filled with helium to its intended rocket launch altitude of 82,000 feet above mean sea level. Most of the atmospheric drag will be overcome while saving precious fuel.

No web site is available at this time.

Suborbital Corporation

Suborbital is the only Russian team in competition for the X PRIZE. Suborbital is located in Moscow, Russia. The name of the spaceship is Cosmopolis XXI. This spaceship is a rocket-powered ship, which rides to a high altitude on a M55 altitude aircraft. Separation occurs at 17 kilometers. Suborbital plans to initially rent the M55 air-



Cosmopolis XXI

craft for prototype and testing flights and then eventually buy a copy for regular sub-orbital flight operations.

The interior of the spaceship is pressurized, but

the passengers are expected to wear pressure suits as a backup. Suborbital plans to operate in Russia, but once the system is proven, they hope to operate around the world.

The team leader is Sergey Kostenko, and his reason for founding the corporation was to open the space tourism market utilizing Russian talent and technology.

No web site is available at this time.

These are just a few of the teams competing for the X PRIZE. I hope this gives you an awareness of how some of the teams are striving to achieve the X PRIZE. To find out more about the teams click on www.xprize.org. Some of the teams are being secretive, and it may be hard to find more information on them, but all of the teams are listed on the X PRIZE web site.

A 2002 report published by the U.S. Department of Commerce's Office of Space Commercialization called the X PRIZE a potential catalyst for the sub-orbital commercial space transportation industry. Certainly the team that wins the X PRIZE will be providing a major step toward an orbital reusable launch industry.

The momentum is progressing. Some of the teams' tests have gone very well, and experts believe a team will win the X PRIZE in 2004. Space travel for the average citizen may not be far off. Click on the X PRIZE website frequently to keep current on the latest developments.

Activity Section

Activity One

THE CLASSIC "EGG-DROP" ACTIVITY

You've probably heard all about this classic egg activity -- or seen it in action! The idea behind the "Egg Drop" is to create a "package" that will protect a raw egg when it's dropped from a height of 8 feet (or whatever height you decide).

You can use many different materials in fashioning a protective cushion for your egg. You can work individually or with someone to create your egg containers. Students will use everything from bub-

ble wrap and foam peanuts to peanut butter. I heard of a student who packed an egg in peanut butter. It survived the fall, but it broke apart when the student tried to pry it out of jar. Some students might even attach parachutes to the packaging if you let them.

Once constructed, you are ready to "drop" your egg from the appointed height. (Want a real test? Drop your egg from a third-story window!) One helpful hint, Spread a plastic tarp over the spot where eggs will land to protect the floor or ground. Of course you can experiment as often as you want with different protective cushions.